ABSTRACT

The invention relates to the design, fabrication, and use of semiconductor devices that employ deep-level transitions (i.e., deep-level-to-conduction-band, deep-level-to-valence-band, or deep-level-to-deep-level) to achieve useful results. A principal aspect of the invention involves devices in which electrical transport occurs through a band of deep-level states and just the conduction band (or through a deep-level band and just the valence band), but where significant current does not flow through all three bands. This means that the deep-state is not acting as a nonradiative trap, but rather as an energy band through which transport takes place. Advantageously, the deep-level energy-band may facilitate a radiative transition, acting as either the upper or lower state of an optical transition.